MEMORY PRODUCTS

FAMILY OVERVIEW

DALLAS SEMICONDUCTOR

http://www.dalsemi.com
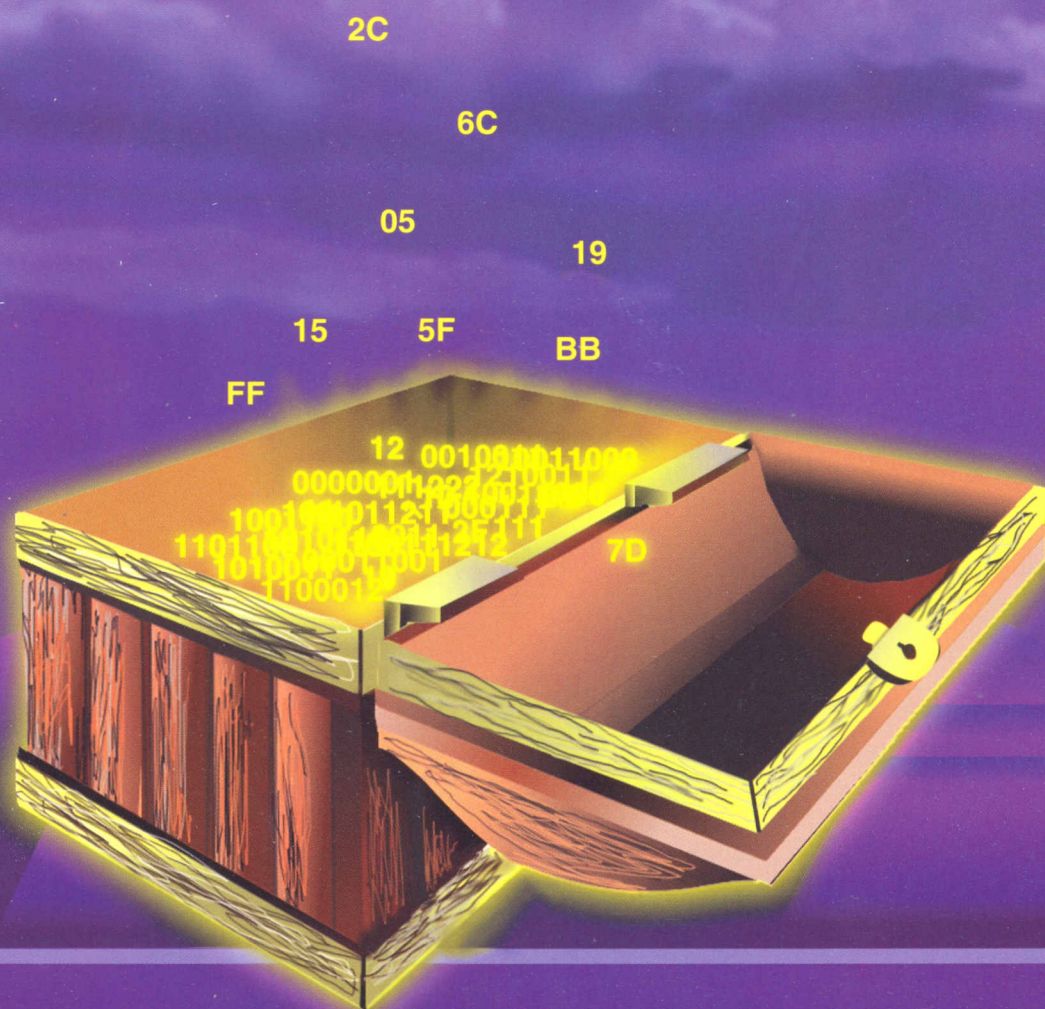
For the latest information about every product we make, visit our World Wide Web site. You'll find the most complete, up-to-date information about our products available seven days a week, 24 hours a day. Here's just some of what you'll find:

- Complete Data Sheets for All Dallas Semiconductor Products Available in Adobe Acrobat™, PostScript™, and HTML Formats
- Application Notes
- New Product Announcements
- Technical Support
- Overviews of All Product Families
- Up-to-date List of World-wide Sales Offices
- Employment Opportunities
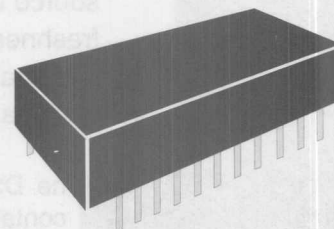- How to Use Our Credit Card Sales Service

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Memory Products

Nonvolatile Memories
◆ Bytewide NV SRAM Modules
◆ Wordwide NV SRAM Modules
◆ Nonvolatile SmartSockets
◆ Partitionable Products
◆ Battery Monitoring Products
◆ 5-Volt Products and 3-Volt Products
◆ Through-Hole and Surface-Mountable Packages

Specialty Memories
◆ First-In First-Out Memories
◆ Multiport Memories
◆ Low Power SRAM

Dallas Semiconductor has combined its understanding of ultra low-power SRAM with improvements in long-life lithium power sources to develop a family of nonvolatile RAMs that retain data for over 10 years in the absence of system power. Unlike EPROM, EEPROM and Flash, NV SRAMs feature an unlimited number of write cycles. And cycle times are as fast as 70 nanoseconds, which makes NV SRAMs ideal for applications like real-time data logging.

Dallas Semiconductor manufactures a variety of battery-backed, nonvolatile SRAM products in its Class 1, 6-inch fabrication facility in Dallas, Texas. Nonvolatile product offerings range from SmartSockets, which battery-back DIP SRAMs, to our new surface-mountable Low Profile Module products. All NV devices are safety-certified by Underwriters Laboratories, and all battery-backed products have an expected minimum battery life of 10 years. Dallas Semiconductor also manufactures a variety of innovative specialty memory products.

Inside...

Original NV SRAM Modules

Features

◆ More than 10 years of data retention
◆ Data automatically protected during power down and power up
◆ Read and write access times as fast as 70 ns
◆ Freshness seal: internal lithium energy source is electrically disconnected to retain freshness until power is first applied
◆ Optional Low Profile Module (LPM) package
◆ Optional industrial temperature range

The lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

The DS12xx nonvolatile SRAMs have a self-contained lithium energy source and control circuitry that constantly monitors Vcc for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. Data is preserved and write protection remains enabled until Vcc returns to its nominal operating range. After Vcc recovers, the lithium energy source is switched off and memory is again accessible just as it was before power loss. Because these memory devices are based on SRAM technology, they have unlimited write endurance and write accesses are as fast as reads. These devices can be used in place of SRAMs conforming to JEDEC standard bytewide pinouts, allowing direct substitution while enhancing performance.
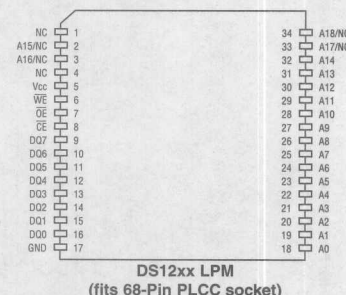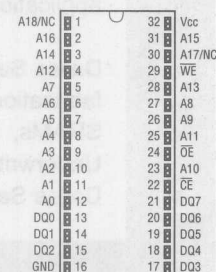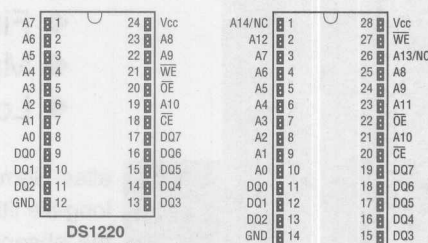
Application Note

Two ways to handle power-down without glitches:

Method 1
1. Select a micro with minimum operating Vcc specification of 4.5 volts or lower.
2. Select a 5%-tolerance power monitor to send an interrupt to your micro at 4.5V<Vcc<4.75V.
3. Select a 10%-tolerance NV SRAM which will not write-protect until 4.25V<Vcc<4.5V.
4. Write an interrupt routine that will make use of the period between processor interrupt and NV SRAM write protect to save data to NV SRAM.

Method 2
1. Select a micro with a minimum operating Vcc specification of 4.5 volts or lower.
2. Select a 5%-tolerance NV SRAM which will write protect itself before the micro goes out of its specified operating range.

Product Selector

2K x 8 NV SRAM

8K x 8 NV SRAM

DS12XXTT-SSS-III

| blank: 0° to 70°C
| IND: -40° to +85°C

100, 120, 150 or 200 ns access (DS1220)
70, 85, 150, 170 or 200 ns access (DS1225)

AB: 5% Vcc tolerance
AD: 10% Vcc tolerance
Y: 10% Vcc tolerance, no freshness seal

DS1220: 2K x 8 memory size
DS1225: 8K x 8 memory size

32K x 8 NV SRAM

128K x 8 NV SRAM

512K x 8 NV SRAM

DS12XXTTP-SSS-III

| blank: 0° to 70°C
| IND: -40° to +85°C

70, 85, 100, 120, 150 or 200 ns access (DS1230)
70, 85, 100 or 120 ns access (DS1245)
70 or 100 ns access (DS1250)

blank: 600 mil DIP
L: Low Profile Module

AB: 5% Vcc tolerance
Y: 10% Vcc tolerance

DS1230: 32K x 8 memory size
DS1245: 128K x 8 memory size
DS1250: 512K x 8 memory size

DS1220
600 mil DIP

A7	1	24	Vcc
A6	2	23	A8
A5	3	22	A9
A4	4	21	WE
A3	5	20	OE
A2	6	19	A10
A1	7	18	CE
A0	8	17	DQ7
DQ0	9	16	DQ6
DQ1	10	15	DQ5
DQ2	11	14	DQ4
GND	12	13	DQ3

DS1225/DS1230
600 mil DIP

A14/NC	1	28	Vcc
A12	2	27	WE
A7	3	26	A13/NC
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	CE
A0	10	19	DQ7
DQ0	11	18	DQ6
DQ1	12	17	DQ5
DQ2	13	16	DQ4
GND	14	15	DQ3

DS1245/DS1250
600 mil DIP

A18/NC	1	32	Vcc
A16	2	31	A15
A14	3	30	A17/NC
A12	4	29	WE
A7	5	28	A13
A6	6	27	A8
A5	7	26	A9
A4	8	25	A11
A3	9	24	OE
A2	10	23	A10
A1	11	22	CE
A0	12	21	DQ7
DQ0	13	20	DQ6
DQ1	14	19	DQ5
DQ2	15	18	DQ4
GND	16	17	DQ3

DS12xx LPM
(fits 68-Pin PLCC socket)

NC	1	34	A18/NC
A15/NC	2	33	A17/NC
A16/NC	3	32	A14
NC	4	31	A13
Vcc	5	30	A12
WE	6	29	A11
OE	7	28	A10
CE	8	27	A9
DQ7	9	26	A8
DQ6	10	25	A7
DQ5	11	24	A6
DQ4	12	23	A5
DQ3	13	22	A4
DQ2	14	21	A3
DQ1	15	20	A2
DQ0	16	19	A1
GND	17	18	A0

Packages not drawn to scale

Partitionable NV SRAM Modules

Features

◆ More than 10 years of data retention

◆ Data automatically protected during power-down and power-up

◆ Programmable write-protection of any of 16 memory array partitions

◆ 5-volt operation (DS16xx modules) or 3-volt operation (DS17xx modules)

◆ Read and write access times as fast as 70 ns (5-volt) and 150 ns (3-volt)

◆ Freshness Seal: internal lithium energy source is electrically disconnected to retain freshness until power is first applied

◆ Optional Low Profile Module (LPM) fits into standard 68-pin PLCC surface mount sockets and provides a power fail output signal ($\overline{PFO}$)

◆ Optional industrial temperature range

Product Selector

DS16XXTTP-SSS-III

- blank: 0° to 70°C
- IND: -40° to +85°
- 70: 70 ns access
- 85: 85 ns access
- 100: 100 ns access
- blank: 600 mil DIP
- L: Low Profile Module
- AB: 5% Vcc tolerance
- Y: 10% Vcc tolerance
- DS1630: 32K x 8 memory size
- DS1645: 128K x 8 memory size
- DS1650: 512K x 8 memory size

5-Volt NV SRAM

DS17XXTTP-SSS-III

- blank: 0° to 70°C
- IND: -40° to +85°C
- 150: 150 ns access
- 200: 200 ns access
- blank: 600 mil DIP
- L: Low Profile Module
- Y: 10% Vcc tolerance
- DS1730: 32K x 8 memory size
- DS1745: 128K x 8 memory size
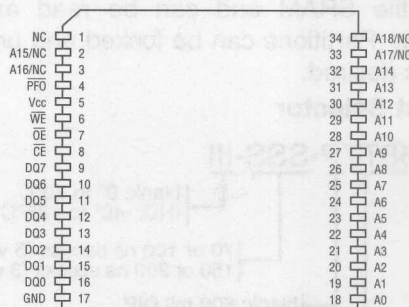- DS1750: 512K x 8 memory size

3-Volt NV SRAM

The DS16xx and DS17xx Partitionable Nonvolatile SRAM modules incorporate all of the functionality of DS12xx SRAM modules and have the same DIP pinouts. In addition to nonvolatility features, partitionable modules divide their memory arrays into 16 identical partitions which can be locked or unlocked via software programming. Locked partitions, which can be read but not written, are used to store program code and important read-only data. Unlocked partitions function as regular nonvolatile SRAM and can be read and written normally. Partitions can be locked and unlocked as often as desired.

Because the partitioning feature in these nonvolatile SRAMs is so flexible and powerful, one partitionable module can replace multiple memory components in a system. RAM, ROM, EPROM, EEPROM and Flash can all be emulated by, and thus replaced by, Partitionable NV SRAM. And because these modules are based on SRAM technology, they have unlimited write endurance and write accesses are as fast as reads.

Please note also the new Low Profile Module package for these modules. This 34-pin package fits standard 68-pin surface-mount PLCC sockets. NV SRAM modules in this package are the only high-density modules in the industry that are surface mountable.

16 identical partitions can be locked or unlocked via software programming.

Pin Description

A0-A18	- Address Inputs
DQ0-DQ7	- Data In/Data Out
$\overline{WE}$	- Write Enable
$\overline{OE}$	- Output Enable
$\overline{CE}$	- Chip Enable
Vcc	- Power Supply
GND	- Ground
NC	- No Connection

**DIP pinouts are identical to DS12xx DIP products.
See page 2 for pin diagrams.**

NC	1		34	A18/NC
A15/NC	2		33	A17/NC
A16/NC	3		32	A14
$\overline{PFO}$	4		31	A13
Vcc	5		30	A12
$\overline{WE}$	6		29	A11
$\overline{OE}$	7		28	A10
$\overline{CE}$	8		27	A9
DQ7	9		26	A8
DQ6	10		25	A7
DQ5	11		24	A6
DQ4	12		23	A5
DQ3	13		22	A4
DQ2	14		21	A3
DQ1	15		20	A2
DQ0	16		19	A1
GND	17		18	A0

**DS16xx/DS17xx LPM
(fits 68-Pin PLCC socket)**

See NV RAM Data Book for package dimensions.

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Wordwide NV SRAM Modules

Features

◆ More than 10 years of data retention

◆ Data automatically protected during power-down and power-up

◆ Programmable write-protection of any of 16 memory array sections (DS1658, DS1758)

◆ 5-volt operation (DS1258, DS1658) or 3-volt operation (DS1758)

◆ Separate upper- and lower-byte chip enables

◆ Read and write access times as fast as 70 ns (5-volt) and 150 ns (3-volt)

◆ Freshness Seal: internal lithium energy source is electrically disconnected to retain freshness until power is applied for the first time

◆ Optional industrial temperature range

Example Application

Internal Block Diagram

E ach of these 128K x 16 nonvolatile SRAMs has a self-contained lithium energy source and control circuitry that constantly monitors Vcc for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. Data is preserved and write protection remains enabled until Vcc returns to its nominal operating range. After Vcc recovers, the lithium energy source is switched off, and memory is again accessible just as it was before power loss. Because these memory devices are based on SRAM technology, they have unlimited write endurance and write accesses are as fast as reads.

In addition to nonvolatility features, DS1658 and DS1758 partitionable modules divide their memory arrays into 16 identical partitions which can be locked or unlocked via software programming. Locked partitions, which can be read but not written, are used to store program code and important read-only data. Unlocked partitions function as regular nonvolatile SRAM and can be read and written normally. Partitions can be locked and unlocked as often as desired.

They have unlimited write endurance and write accesses are as fast as reads.

Pin Description

A0-A16	- Address Inputs
DQ0-DQ15	- Data In/Data Out
$\overline{WE}$	- Write Enable
$\overline{OE}$	- Output Enable
$\overline{CEU}$	- Chip Enable, Upper
$\overline{CEL}$	- Chip Enable, Lower
Vcc	- Power Supply
GND	- Ground

Product Selector

DS1X58TTP-SSS-III
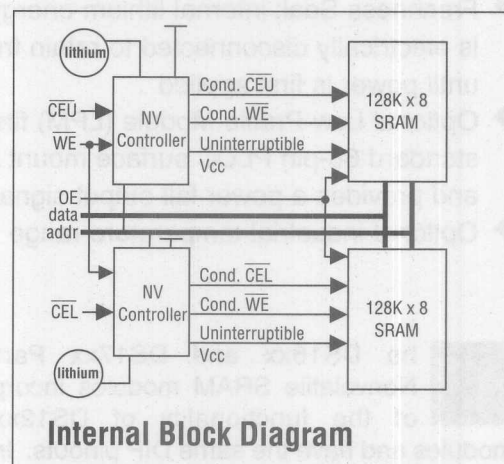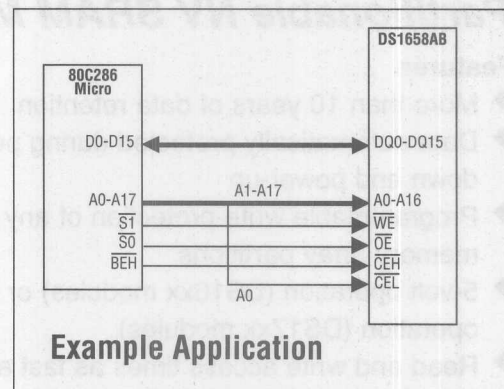
blank: 0° to 70°C
IND: -40° to +85°C

70 or 100 ns access (5 volt)
150 or 200 ns access (3 volt)

blank: 600 mil DIP

AB: 5% Vcc tolerance
Y: 10% Vcc tolerance

DS1258: 128K x 16 memory size, 5 volt
DS1658: 128K x 16 memory size, 5 volt, Partitionable
DS1758: 128K x 16 memory size, 3 volt, Partitionable

Packages not drawn to scale

DS1258/DS1658/DS1758
600 mil DIP

$\overline{CEU}$	1		40	Vcc
$\overline{CEL}$	2		39	$\overline{WE}$
DQ15	3		38	A16
DQ14	4		37	A15
DQ13	5		36	A14
DQ12	6		35	A13
DQ11	7		34	A12
DQ10	8		33	A11
DQ9	9		32	A10
DQ8	10		31	A9
GND	11		30	GND
DQ7	12		29	A8
DQ6	13		28	A7
DQ5	14		27	A6
DQ4	15		26	A5
DQ3	16		25	A4
DQ2	17		24	A3
DQ1	18		23	A2
DQ0	19		22	A1
$\overline{OE}$	20		21	A0

DS13xx NV SRAM Modules

Features
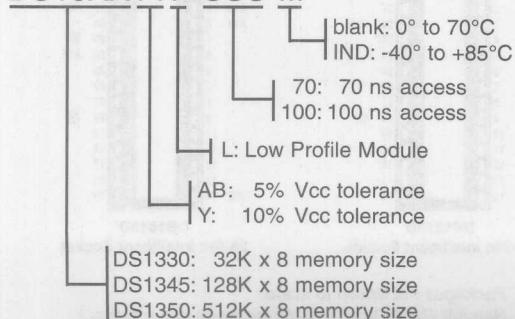
◆ More than 10 years of data retention

◆ Data automatically protected during power-down and power-up

◆ Read and write access times as fast as 70 ns

◆ Reset output holds system in reset when power supply goes out of tolerance and acts as a power-on reset

◆ Battery Warning output indicates when the internal lithium energy source is nearing end of life

◆ Low profile module (LPM) package fits into standard 68-pin PLCC surface-mountable sockets

◆ Optional industrial temperature range

E each of these bytewide nonvolatile SRAMs has a self-contained lithium energy source and control circuitry that constantly monitors Vcc for an out-of-tolerance condition. When such a condition occurs, the lithium energy source is automatically switched on and write protection is unconditionally enabled to prevent data corruption. Data is preserved and write protection remains enabled until Vcc returns to its nominal operating range. After Vcc recovers, the lithium energy source is switched off, and memory is again accessible just as it was before power loss. Because these memory devices are based on SRAM technology, they have unlimited write endurance and write accesses are as fast as reads.
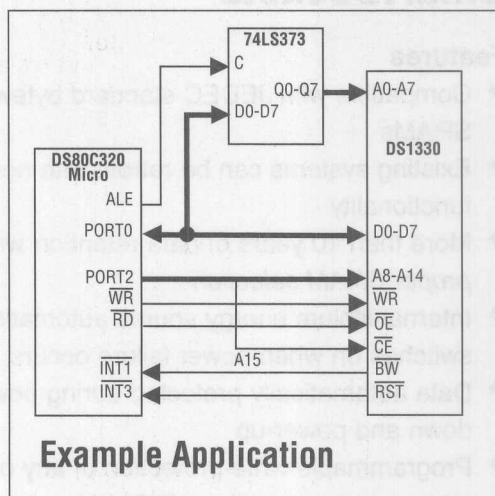
In addition to nonvolatility, these devices also have dedicated outputs useful for monitoring the status of Vcc and the status of the internal lithium source. When Vcc goes out of tolerance, the Reset signal is activated to hold the system in reset during power-down. Likewise, just before the lithium energy source has reached end of life, the Battery Warning signal is activated to indicate that the module should be replaced.
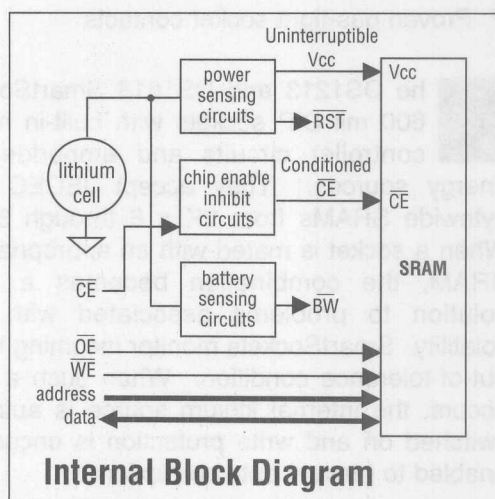
Product Selector

DS13XXTTP-SSS-III

blank: 0° to 70°C
IND: -40° to +85°C

70: 70 ns access
100: 100 ns access

L: Low Profile Module

AB: 5% Vcc tolerance
Y: 10% Vcc tolerance

DS1330: 32K x 8 memory size
DS1345: 128K x 8 memory size
DS1350: 512K x 8 memory size

See NV RAM Data Book for package dimensions.

Example Application

Internal Block Diagram

These devices have dedicated outputs useful for monitoring the status of Vcc and the status of the internal lithium source.

Pin Description

A0-A18	- Address Inputs
DQ0-DQ7	- Data In/Data Out
$\overline{WE}$	- Write Enable
$\overline{OE}$	- Output Enable
$\overline{CE}$	- Chip Enable
$\overline{RST}$	- Reset Output
$\overline{BW}$	- Battery Warning Output
Vcc	- Power Supply
GND	- Ground
NC	- No Connection

**DS13xx LPM
(fits 68-Pin PLCC socket)**

SmartSockets

Features

♦ Compatible with JEDEC standard bytewide SRAMs

♦ Existing systems can be retrofit with nonvolatile functionality

♦ More than 10 years of data retention *with the proper SRAM selection*

♦ Internal lithium energy source automatically switches on when power failure occurs

♦ Data automatically protected during power-down and power-up

♦ Programmable write-protection of any of 16 memory array partitions (DS1613 only)

♦ Proven gas-tight socket contacts

T he DS1213 and DS1613 SmartSockets are 600 mil DIP sockets with built-in nonvolatile controller circuits and embedded lithium energy sources. They accept JEDEC standard bytewide SRAMs from 2K x 8 through 512K x 8. When a socket is mated with an appropriate CMOS SRAM, the combination becomes a complete solution to problems associated with memory volatility. SmartSockets monitor incoming Vcc for an out-of-tolerance condition. When such a condition occurs, the internal lithium source is automatically switched on and write protection is unconditionally enabled to prevent data corruption.

In addition to nonvolatility features, the DS1613 SmartSockets divide their memory arrays into 16 identical partitions which can be locked or unlocked via software programming. Locked partitions, which can be read but not written, are used to store program code and important read-only data. Unlocked partitions function as regular nonvolatile SRAM and can be read and written normally. Partitions can be locked and unlocked as often as desired.

When a socket is mated with an appropriate CMOS SRAM, the combination becomes a complete solution to problems associated with memory volatility.

Application Note

Making the proper SRAM selection:

Each SmartSocket has two 45 mAh batteries. What should the maximum standby current be for an SRAM mated to a SmartSocket if data is to be retained at least 10 years?

$$\frac{90\text{mAh}}{10 \text{ years}} \bullet \frac{1 \text{ year}}{365 \text{ days}} \bullet \frac{1 \text{ day}}{24 \text{ h}} = 1.027 \text{ μA}$$
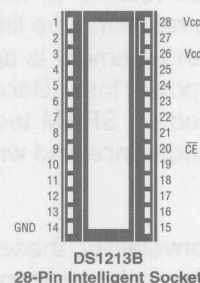
The following Dallas Semiconductor SRAMs have standby currents < 1μA:
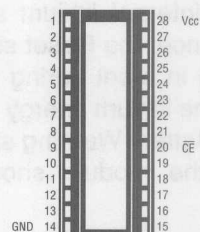
DS2016   2K x 8
DS2064   8K x 8   *See page 9 for details.*
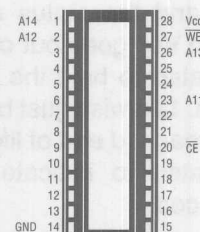
Pin Description

$\overline{CE}$	- Conditioned Chip Enable
$\overline{WE}$	- Write Enable
A16-A11	- Address Inputs (for partition programming)
Vcc	- Switched Vcc
GND	- Ground
NC	- No Connection
All other pins pass through	

DS1213B
28-Pin Intelligent Socket

DS1213C
28-Pin Intelligent Socket

DS1613C
28-Pin Intelligent Socket
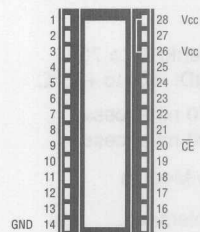
DS1213D
28-Pin Intelligent Socket
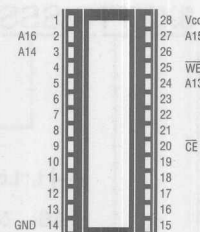
DS1613D
28-Pin Intelligent Socket

Packages not drawn to scale.
See NV RAM Data Book for package dimensions.

Product Selector

	Fits 2K x 8 SRAM	Fits 8K x 8 SRAM	Fits 32K x 8 SRAM	Fits 128K x 8 SRAM	Fits 512K x 8 SRAM
DS1213B	✔	✔			
DS1213C			✔		
DS1213D				✔	✔*
DS1613C			✔		
DS1613D				✔	

* with user modifications

First-In First-Out Memories

Features

◆ Identical pinouts across all densities
◆ Low-power HCMOS technology
◆ Asynchronous and simultaneous read/write
◆ Fully expandable by word width or depth
◆ Empty, full and half-full flags
◆ Retransmit capability
◆ High speed: 35ns, 50ns, 65ns, 80ns and 120ns devices available
◆ Optional industrial temperature range available

The DS20xx FIFO chips implement a first-in first-out algorithm featuring asynchronous accesses, full, empty and half-full flags, and unlimited expansion capability in both word size and depth. The main application of these devices is that of a rate buffer, sourcing and absorbing data at different rates (e.g., interfacing fast processors and slow peripherals). The full and empty flags are provided to prevent data overflow and underflow. The half-full flag is available in the single-device and width-expansion configurations. Since accesses are internally sequential, no address information is required. As a result, all devices in this family have identical pinouts, making density upgrade easy.

Product Selector

DS20XXP-SSS-I

blank: 0° to 70°C
N: -40° to +85°C

35: 35ns access
50: 50ns access
65: 65ns access
80: 80ns access
120: 120ns access

blank: 28-pin 600 mil DIP
D: 28-pin 600 mil DIP
R: 32-pin PLCC

DS2009: 512 x 9 FIFO
DS2010: 1K x 9 FIFO
DS2011: 2K x 9 FIFO
DS2012: 4K x 9 FIFO
DS2013: 8K x 9 FIFO

Pin Description

$\overline{W}$	- Write
$\overline{R}$	- Read
$\overline{RS}$	- Reset
$\overline{FL}/RT$	- First Load/Retransmit
D0-D8	- Data In
Q0-Q8	- Data Out
$\overline{XI}$	- Expansion In
$\overline{XO}/HF$	- Expansion Out
$\overline{FF}$	- Full Flag
$\overline{EF}$	- Empty Flag
VCC	- Power Supply
GND	- Ground
NC	- No Connect
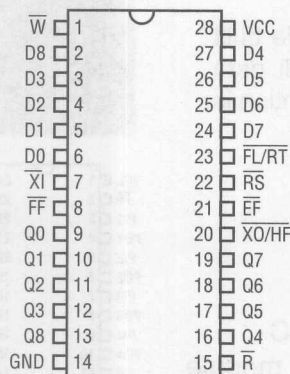
DS20xx
300 mil DIP
600 mil DIP
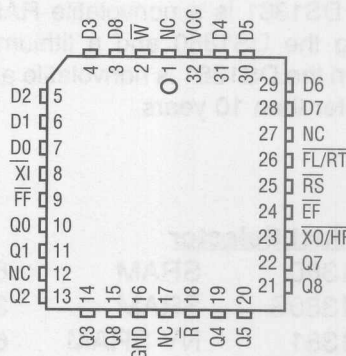
DS20xx
Rectangular PLCC

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RAMport

Features

◆ 2K x 8 Static RAM (DS1380) and 2K x 8
  Nonvolatile Static RAM (DS1381)

◆ Provides bytewide access to SRAM or NV
  SRAM while consuming only two microcontroller
  port pins

◆ More than 10 years of data retention (DS1380
  with battery or DS1381)

◆ Muliplexed address/data bus reduces pin count

◆ Power Fail output pin

◆ Write-protect voltage can be set to 5% or 10%
  via TOL input pin
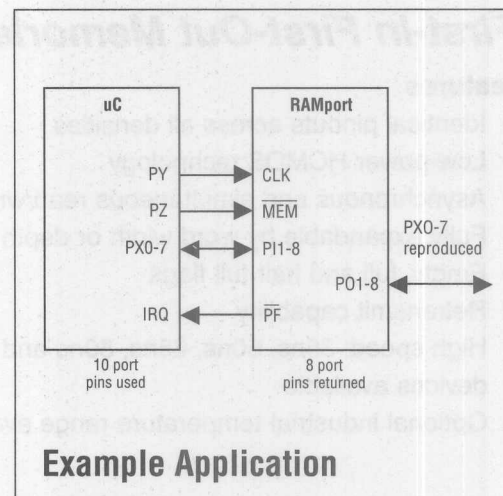

Example Application

The DS1380 RAMport is a 2K x 8 SRAM designed to connect directly to the port pins of a microcontroller. Data and address information are passed between the microcontroller and the RAMport on an 8-bit multiplexed bus. The eight microcontroller port pins that are connected to the RAMport are not consumed by their connection to this memory, however. Each of these port pins is actually reproduced by the RAMport for general purpose use. The reproduced port pins can be inputs or outputs and can appear exactly the same as the I/O pins on the attached microcontroller. Two other port pins are used to switch between memory access and I/O port access and to provide a clock reference for memory access timing.

RAMport memory contents are read or written with three successive cycles containing high-order address, low-order address and then data. Control and status information is passed to the RAMport along with the high-order address information. While the RAMport memory is being accessed, the reproduced port pins maintain their values. Likewise, while the reproduced port pins are toggled, RAMport memory remains unchanged.

The DS1381 is a nonvolatile RAMport module built using the DS1380 and a lithium battery. All data within the DS1381 is nonvolatile and data retention is greater than 10 years.

Internal Block Diagram

Pin Description

TOL	- Tolerance Selection Input
$\overline{PF}$	- Power Fail Output
PI1-PI8	- Port Inputs (From Micro)
PO1-PO8	- Port Outputs (To System)
CLK	- Clock
$\overline{MEM}$	- Memory Select Input
VBAT	- Battery Input
VCC	- Power Supply
GND	- Ground
NC	- No Connection

Product Selector

DS1380	SRAM	600 mil DIP
DS1380S	SRAM	300 mil SOIC
DS1381	NV SRAM	600 mil DIP module
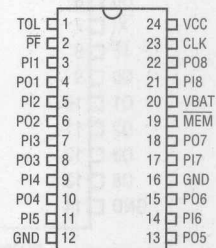
DS1380	DS1381
600 mil DIP	600 mil DIP
300 mil SOIC	
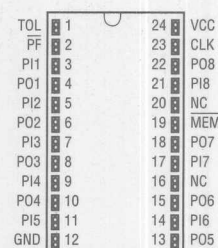
Dual Port RAM

Features

◆ Totally asynchronous 256-byte dual port memory

◆ Multiplexed address/data bus reduces pin count

◆ Dual-ported memory allows simultaneous random access with minimal arbitration

◆ Fast access: 50 ns

◆ Reduced-speed performance down to 2.5 volts

◆ Low-power CMOS design

◆ Operating temperature range: -40°C to +85°C

◆ Standby current of 100nA at 25°C makes the device ideal for battery backup or battery operate applications

Product Selector

DS1609	600 mil DIP
DS1609S	300 mil SOIC

```
        ┌───∪───┐
AD7A  □ 1      24 □ VCC
AD6A  □ 2      23 □ OEB
AD5A  □ 3      22 □ CEB
AD4A  □ 4      21 □ WEB
AD3A  □ 5      20 □ AD0B
AD2A  □ 6      19 □ AD1B
AD1A  □ 7      18 □ AD2B
AD0A  □ 8      17 □ AD3B
WEA   □ 9      16 □ AD4B
CEA   □ 10     15 □ AD5B
OEA   □ 11     14 □ AD6B
GND   □ 12     13 □ AD7B
        └───────┘
```
DS1609
600 mil DIP
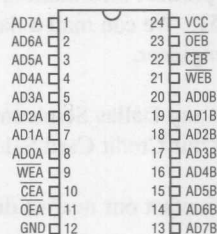300 mil SOIC

DS2016, DS2064

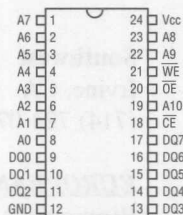# Low Power SRAMs

Features
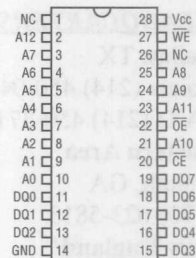
◆ Low power CMOS design

◆ Standby current is less than 50nA at 3.0V and 25°C—ideal for use with DS1213B SmartSocket or Dallas Semiconductor nonvolatile controllers

◆ Operating voltage range: 2.7V to 5.5V

◆ Data retention voltage range: 2.0V to 5.5V

◆ Access time: 150ns at 5.0V and 300ns at 3.0V

◆ Operating temperature range: -40°C to +85°C

◆ TTL-compatible inputs and outputs

◆ Excellent for both battery backup and battery operate applications

Product Selector

DS2016	2K x 8	600 mil DIP
DS2016S	2K x 8	330 mil SOIC
DS2064	8K x 8	600 mil DIP
DS2064S	8K x 8	330 mil SOIC

```
        ┌───∪───┐
A7   □ 1      24 □ Vcc
A6   □ 2      23 □ A8
A5   □ 3      22 □ A9
A4   □ 4      21 □ WE
A3   □ 5      20 □ OE
A2   □ 6      19 □ A10
A1   □ 7      18 □ CE
A0   □ 8      17 □ DQ7
DQ0  □ 9      16 □ DQ6
DQ1  □ 10     15 □ DQ5
DQ2  □ 11     14 □ DQ4
GND  □ 12     13 □ DQ3
        └───────┘
```
DS2016
600 mil DIP
330 mil SOIC

```
        ┌───∪───┐
NC   □ 1      28 □ Vcc
A12  □ 2      27 □ WE
A7   □ 3      26 □ NC
A6   □ 4      25 □ A8
A5   □ 5      24 □ A9
A4   □ 6      23 □ A11
A3   □ 7      22 □ OE
A2   □ 8      21 □ A10
A1   □ 9      20 □ CE
A0   □ 10     19 □ DQ7
DQ0  □ 11     18 □ DQ6
DQ1  □ 12     17 □ DQ5
DQ2  □ 13     16 □ DQ4
GND  □ 14     15 □ DQ3
        └───────┘
```
DS2064
600 mil DIP
330 mil SOIC

Application Notes

The following is a listing of available applications notes for Memory Products.
For a copy of any of these publications, call (214) 450-0448.

Application Note 4	DS1213, DS1216, DS1613 SmartSocket/SmartWatch Options
Application Note 51	How to Save Data During A Power Failure Without Corrupting It
Application Note 53	Designing a Nonvolatile 2M x 16 Memory Subsystem
Application Note 61	RAMport
Application Note 62	Dual Port RAM
Application Note 63	Using Nonvolatile Static RAMs

DALLAS
SEMICONDUCTOR

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For technical product information, call (214) 450-0448 or FAX us at (214) 450-3715. If calling from overseas, dial (214) 450-5351. We can mail a data book and product literature immediately, or we can have you talk to an applications engineer.

You can order any Dallas Semiconductor product for next-day shipment with a Visa, MasterCard, or American Express. Call our Credit Card Sales at 1-800-336-6933.

You can also contact our nearest distributor, representative, or sales office.

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